PATENT SPECIFICATION

DRAWINGS ATTACHED

846,748

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COMPLETE SPECIFICATION

Improvements in and relating to Drill Column Structures

WE, SLOVACKE STROJIRNY, NARODNI PODNIK, of Uhersky Brod, Czechoslovakia, a Czechoslovak National Corporation, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:

This invention relates to drill columns.

Drill tubes used for rotary well drilling columns are usually coupled by screw-threaded joints, which guarantee a rigid connection of the set of tubes which may be easily disconnected, enabling the successive joining of further tubes in the case of increasing depth of the bore and easy dismantling when the whole drilling column has to be raised out of the borehole. During operation the whole drilling column is subjected to considerable stresses due to pull, torques and bending forces. These forces change with the depth and diameter of the borehole and with the resistance of the drilled material, and achieve their maximum value when the tool becomes wedged in the borehole. The complicated stresses during rotation of the drill column rather frequently lead to ruptures due to fatigue of the metal, more especially in the screw-threaded parts and particularly at the base of the screw-threads. On the other hand a tapering thread does not guarantee a perfect tightness for the flushing water passing through the tubes, and screw-threads affected by the flushing water creeping between them may equally well lead to damage to the joint and to rupture of the drill tubes.

It has been already proposed to overcome these drawbacks by providing at the non-screw-threaded end of a coupling sleeve having a tapered screw-thread, a plain tapered surface adjacent to the tapered screw-thread part, by means of which tapered surface the coupling sleeve comes in snug contact with a complementary tapered surface of the drill tube adjacent to the tapered screw-thread part thereof. According to a further prior proposal the tightness of the joint is increased by arranging the non-screw-threaded tapered surfaces of the drill tube and the coupling sleeve at approximately the same angle as the tapered screw-threaded parts of the sleeve and tube. A free cylindrical space is left where the screw-threaded and non-screw-threaded parts join so that the screw-threaded part of the joint extends only along a part of the tapered end of the tube and of the coupling sleeve. In another prior arrangement the tapered sealing surfaces of the tube and sleeve are each divided into two zones, that one which is adjacent to the screw-threaded part having substantially the same inclination as said screw-threaded part, while the outer zone is at a greater angle relative to the joint axis.

It is an object of the present invention to provide a joint for drill tubes wherein the threads are relieved of strains during bending or deviations of the pipe column, where a perfectly water-tight joint is achieved and where the maximum possible safety against rupture at the joints is provided.

According to the invention there is provided a drill column tube coupling, characterised in that each tube end is formed with an axially endmost tapered surface having a screw-thread, an axially inward tapered surface having a plain surface, and an intermediate conical surface joining said screw-threaded and plain surfaces, the tube end being screwed into a sleeve having complementary internal screw-threaded plain tapered and conical surfaces, the portion of the tube formed with the screw-threaded plain tapered and conical surfaces having an increased wall thickness, the arrangement being such that, in the fully tightened position of the coupling water-tight engagement of the respective plain tapered surfaces of the tube and sleeve is effected before the

respective conical surfaces contact one another.

The invention is illustrated by way of example in the accompanying drawing, wherein Figure 1 is a longitudinal section through the joint of a drill tube and coupling sleeve;

Figure 2 is a much enlarged view of a portion of Figure 1; and

Figure 3 is an elongational view of a part of a drill column.

The drill tube 1 is provided near its end with a region 11 of increased wall thickness. From this region 11 leads a slightly tapered surface 3 which terminates in a conical surface 7 forming a greater angle to the tube axis than said tapered surface 3 and leading to an end tapered screw-thread portion 5 having a gradually deepening screw thread part 5*a* (Fig. 2). The coupling sleeve 2 has complementary regions comprising at its outer end a tapered inner surface 4 leading to a conical surface 8 of the same angle as the surface 7 of the tube 1 and continuing with a tapered screw-thread portion 6.

The sleeve 2 is screwed on the tube 1 until the tapered sealing surfaces 3, 4 of the tube and sleeve come into snug contact and provide a perfect seal, preventing leakage of the flushing water.

The tapered screw-threads 5, 6 and the sealing surfaces 3, 4 are arranged so that upon tightly screwing on the sleeve a part 9 of the tapered surface 3 on the pipe remains uncovered by the sleeve. Similarly a free space is left between the tapered inner surface 4 of the sleeve 2 and the inner end 5*a* of the tapered screw-thread 5 on the pipe 1 so that the said end of the screw-thread on the pipe 1 remains always out of contact with the sleeve, compensating for any possible deformation of the threads due to thermal or other influences.

The tapered sealing region of the joint is relatively short, but due to its perfect and concentric arrangement it seals the screw-threads in a reliable way and relieves the screw-threaded part of the tube of bending forces. The screw-threaded region of the joint, on the contrary, is relatively long and extends from a part of the pipe of greater wall thickness than the pipe proper. Though manufacture of such pipes, due to the upsetting of the ends, is somewhat more complicated than is the case with the known pipes referred to above, the strength of the joint is substantially increased as the threads are cut in a portion of the upset part of the pipe end; ruptures mostly occur at the near or inner ends of the thread. On the other hand the tapered sealing surface 3 is provided at a larger diameter portion of the upset part of the pipe and said surface has an angle which, as shown, is preferably equal to that of the screw-threaded portion. There is furthermore a certain free space left, after tightening of the joint, between the surfaces 7, 8 connecting the tapered and screw-threaded both said parts of different diameter parts of the pipe and the coupling sleeve respectively, said space preventing any deformation at the inner end of the pipe screw-thread when the manufacture is not quite perfect; the said space also prevents any longitudinal deformation of the screw-threads when carrying out the screwing operation at elevated temperatures.

Figure 3 shows three tube sections 1 coupled together by sleeves 2. The upper connection in this Figure is effected by a single sleeve having a screw-threaded portion 6 and a tapered sealing surface 4 at each end with which the tube ends are engaged as shown in Figures 1 and 2. The lower connection in Figure 3 is formed by two sleeves 2 the lower of which is similar to the uppermost single sleeve, while the other is formed of a screw-threaded portion 6 and tapered sealing surface 4 only at its upper end to receive the lower end of the intermediate tube section. The lower end of this other sleeve 2 is itself formed with a screw-threaded portion and a tapered sealing surface, similarly to the tube sections 1, which is engaged in the end of the lowermost sleeve.

WHAT WE CLAIM IS: —

1. A drill column tube coupling, characterised in that each tube end is formed with an axially endmost tapered surface having a screw-thread, an axially inward tapered surface having a plain surface, and an intermediate conical surface joining said screw-threaded and plain surfaces, the tube end being screwed into a sleeve having complementary internal screw-threaded plain tapered and conical surfaces, the portion of the tube formed with the screw-threaded, plain tapered and conical surfaces having an increased wall thickness, the arrangement being such that, in the fully tightened position of the coupling, water-tight engagement of the respective plain tapered surfaces of the tube and sleeve is effected before the respective conical surfaces contact one another.

2. Coupling as claimed in Claim 1, characterised in that, in the fully tightened position, the plain tapered surface of the tube extends beyond the corresponding end of the sleeve.

3. Coupling as claimed in Claim 1 or 2, wherein the screw-threaded and plain tapered surfaces are at substantially the same angle to the drill column axis.

4. Drill column tube coupling substantially as hereinbefore described with reference to the accompanying drawings.

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846,748 COMPLETE SPECIFICATION

1 SHEET

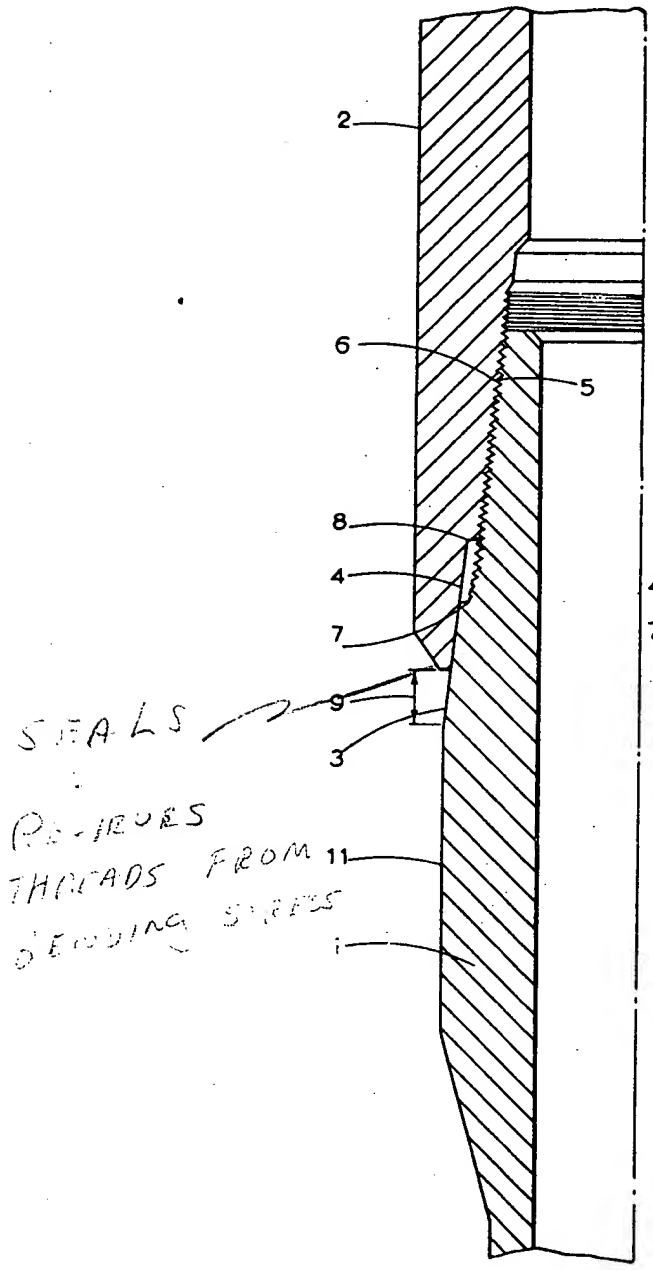

FIG. 1

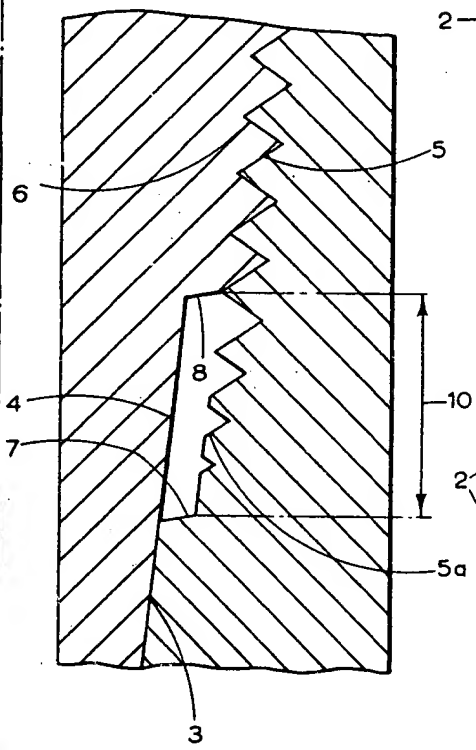

FIG. 2

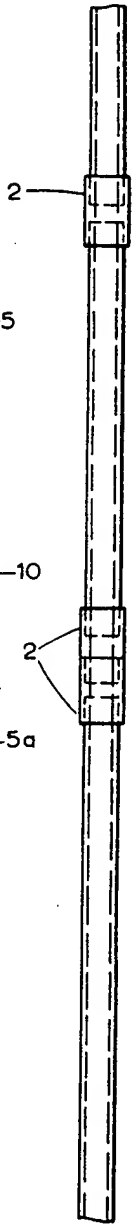

FIG. 3

SEALS

RELIEVES THREADS FROM BENDING STRESS